Introduction to Robotics – Exercise 2 – Report

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Summery

In this report we'll explain our coverage algorithm and report its success. Generally, the algorithm let the robot wander around randomly until most of the arena is covered.

Algorithm Description

Explanation: The algorithm let the robot drive at full speed until one of its front bumpers pressed, and then stop and change driving angle by turning in a random speed (and direction) for a random time (up to 3 seconds), and then drive again and so on.

General Pseudo-Code:
1. Drive until hit an obstacle.
2. Change driving angle randomly.
3. Back to 1.

Loop Function Pseudo-Code:
1. if timer stopped:
    a. if not bumped:
        1) drive at full speed.
    b. else:
        1) set random angular speed and rotation time.
        2) set timer and start it.
2. else:
    a. turn (with an angular speed set in 1.b.1).

Note: we found that it doesn't matter if one of the other bumpers pressed because the driving is forward. We found that the rear bumpers never pressed, but sometimes the right or the left bumpers are pressed. We decided to ignore side presses because the driving is forward so we can save turnings.
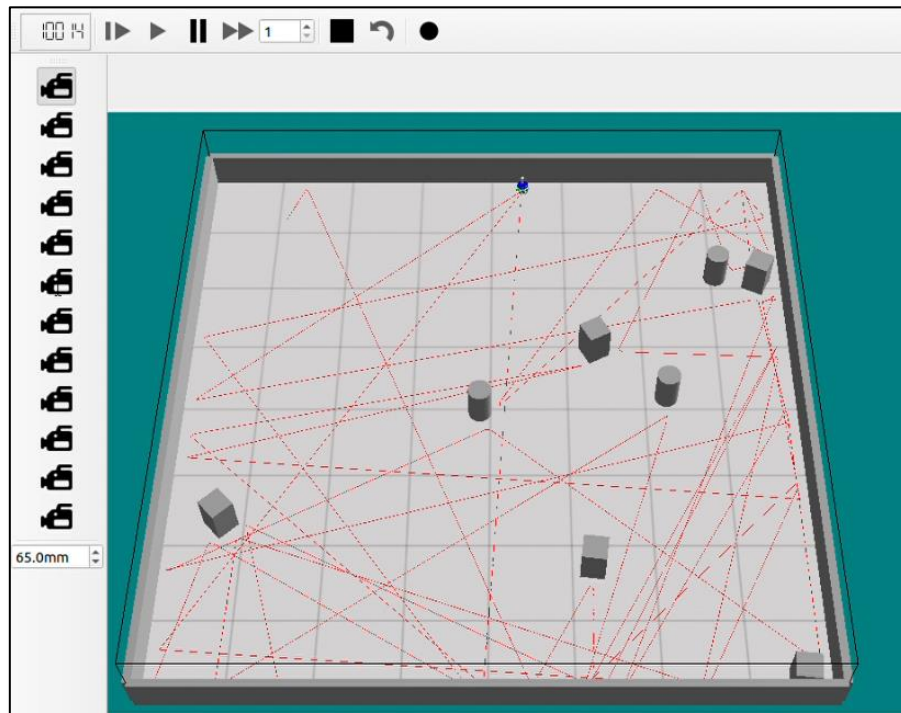
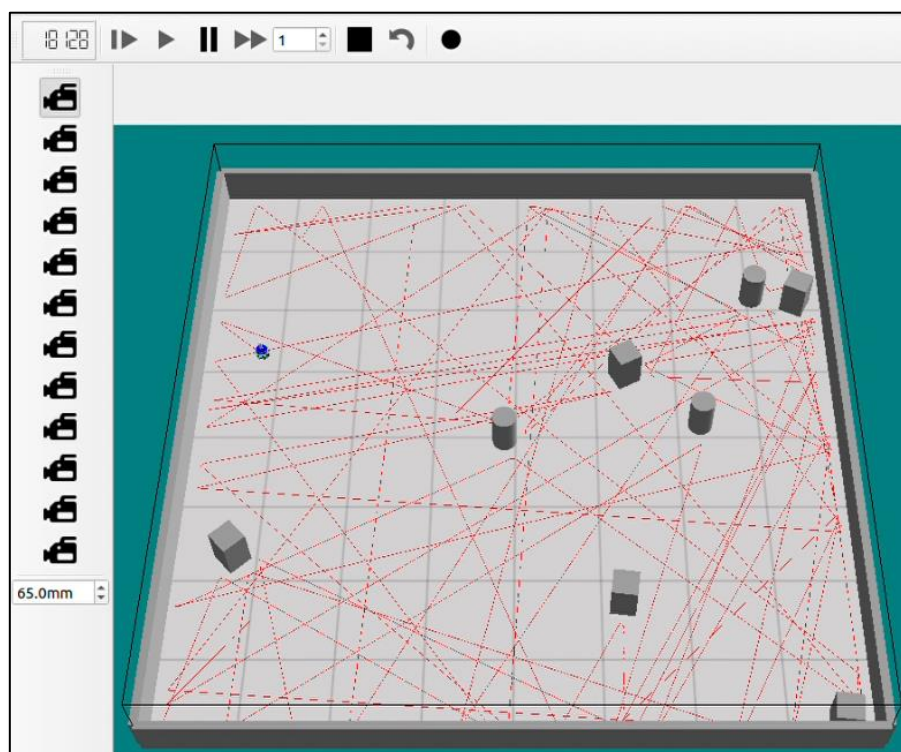**Success Report for** $random\_seed = 1$

In this test the arena was reasonably covered in 10,000 clock ticks. This result is nice but not very satisfies because there is only one small part that is not covered enough, and it is gets covered only in about 18,000 clock ticks.

Here is a screen shot at 10,014 clock ticks:

As we can see there is only a small part in the upper-left part of the arena that is not covered, and that is happening due to the concentration of obstacles in the rest of the arena.
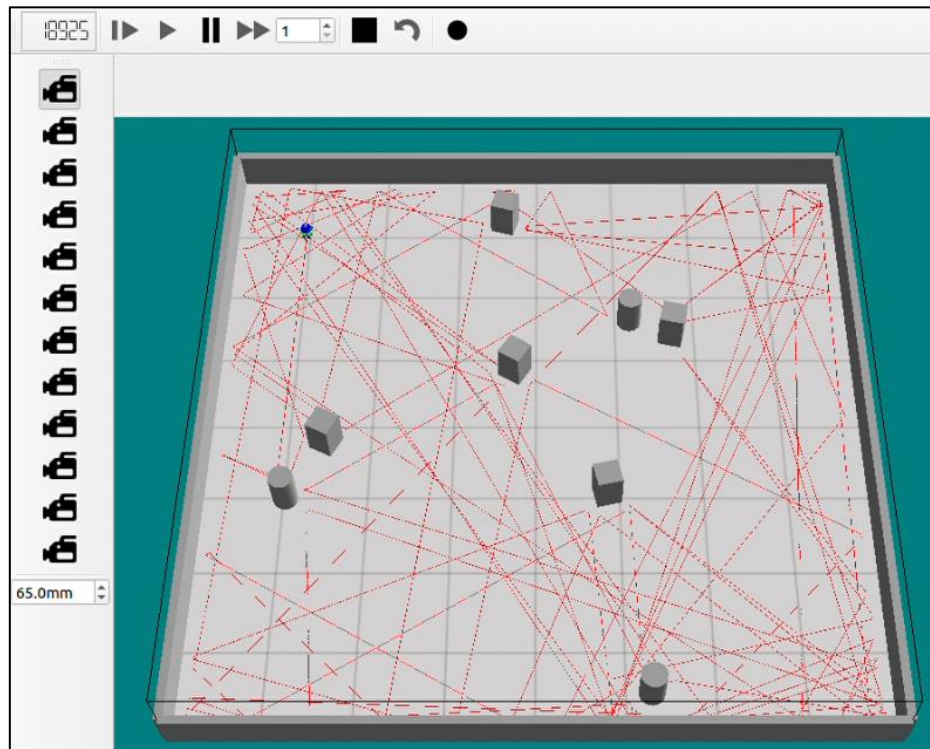
Anyway, we considered this test end in 18,128 clock ticks. Here is a screen shot from the end:
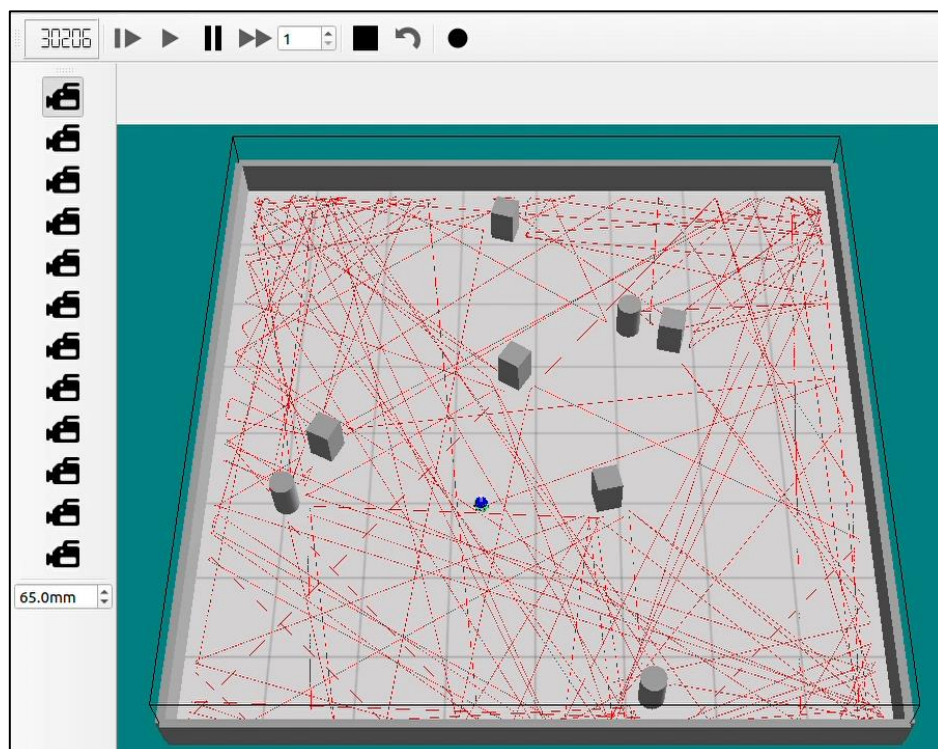
Success Report for $random\_seed = 2$

In this test the arena was reasonably covered in 18,000 clock ticks but we considered the arena covered enough only in 30,206 clock ticks. This result maybe worse than the previous test, but it is not too bad considering that end result was a very covered arena.

Here is a screen shot at 18,925 clock ticks:

As we can see the arena is fairly covered, but we are not sure it is enough to determine this point as the end of the test.

In the end, we considered this test end in 30,206 clock ticks. Here is a screen shot:
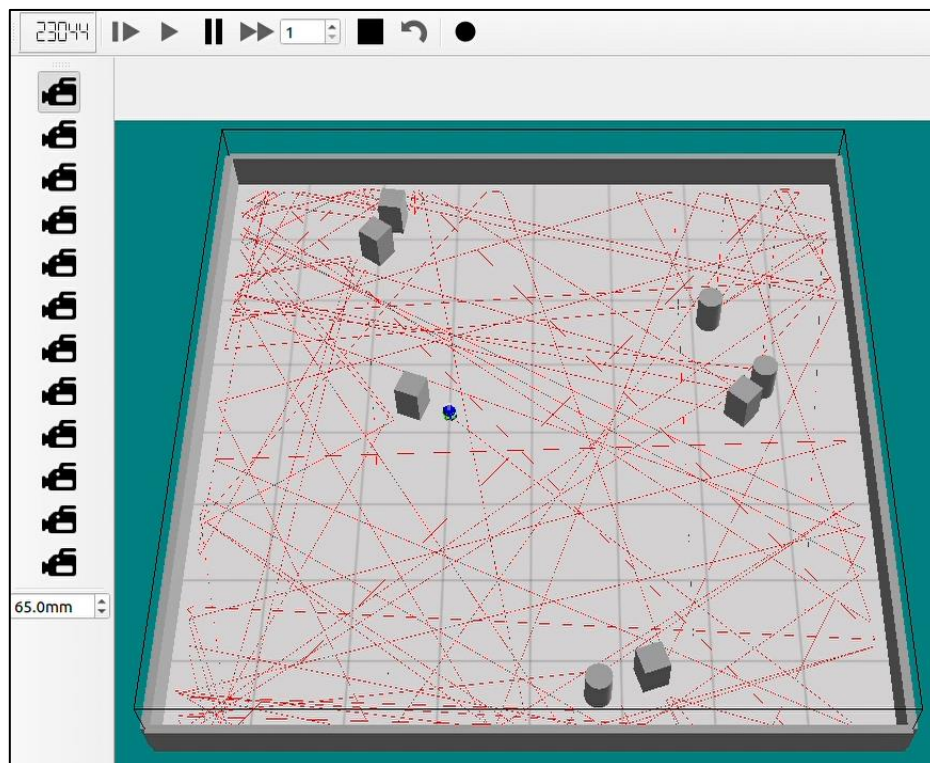
We are indeed satisfied by the fact that the Krembot found no problem to pass between two adjacent obstacles. Here is a screenshot:
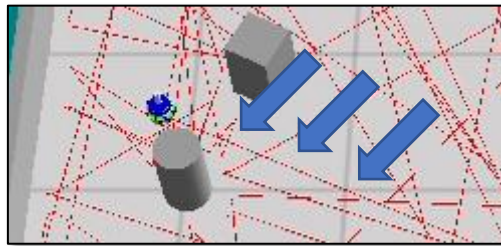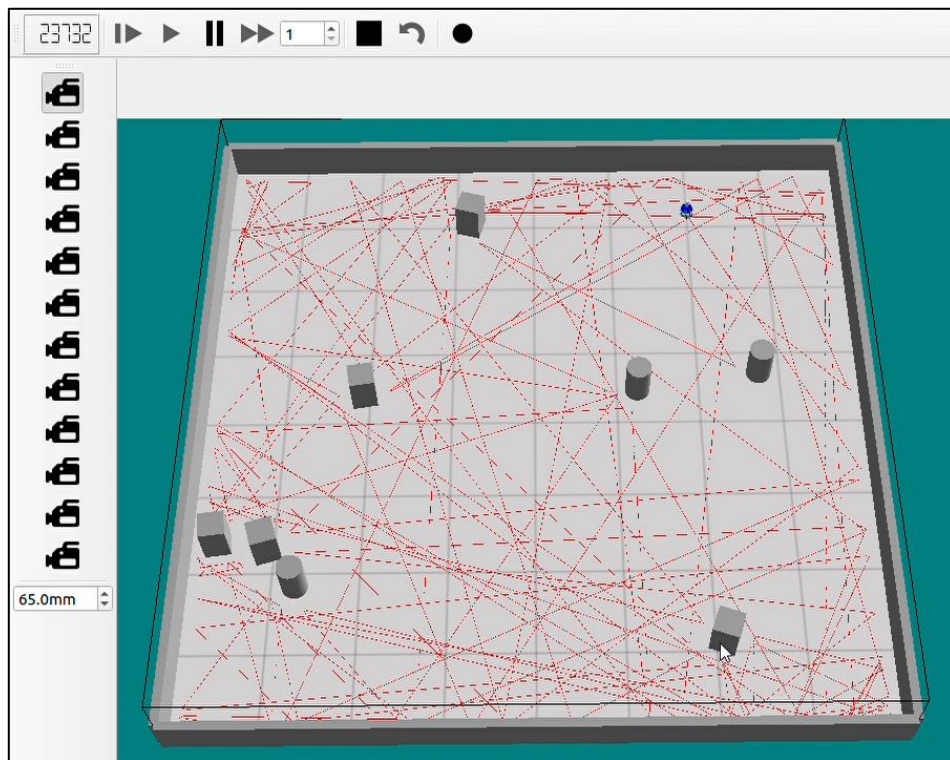

Success Report for $random\_seed = 3$

In this test the arena was covered enough in 23,044 clock ticks and we are satisfied by this result to we determined this point as the end of the test:
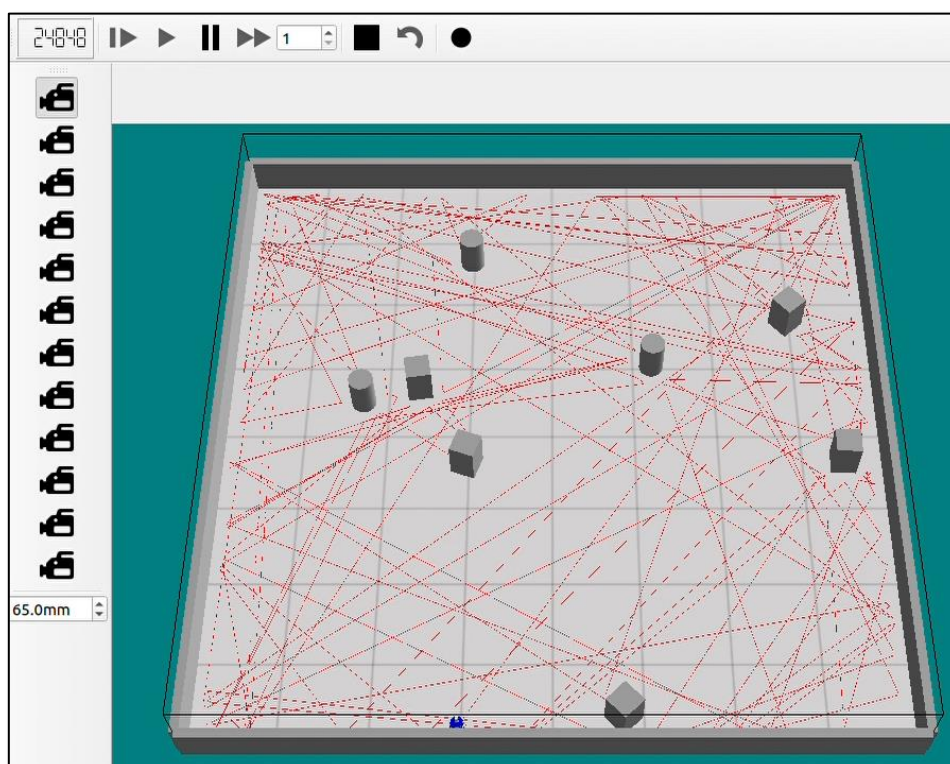
Success Report for $random\_seed = 4$

In this test the arena was <u>covered enough in 23,732 clock ticks</u> and we are satisfied by this result to we determined this point as the end of the test:


Success Report for $random\_seed = 5$

In this test the arena was <u>covered enough in 24,848 clock ticks</u> and we are satisfied by this result to we determined this point as the end of the test:
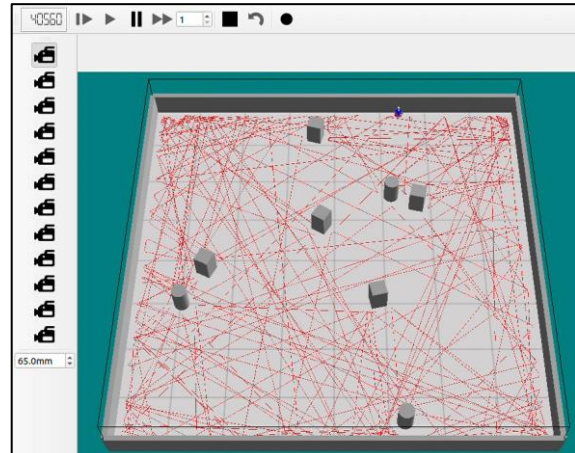
Important Note 1: We ran each test for 1.5 hour (around 40,000 clock ticks) so if the end states we determined to the tests above are not considered as covered enough, here are screen shots from the end of the records:
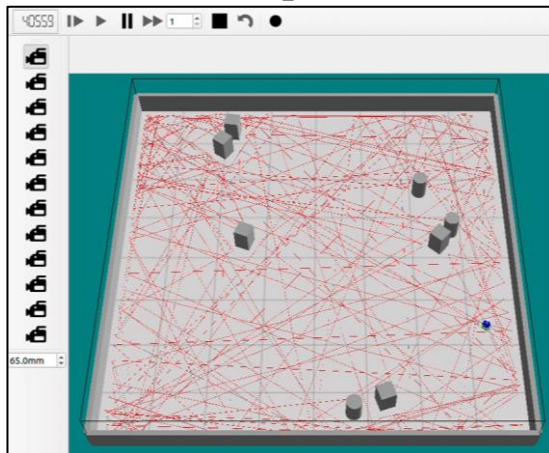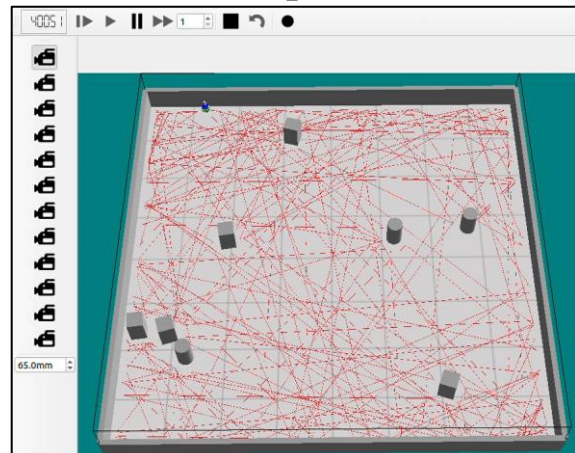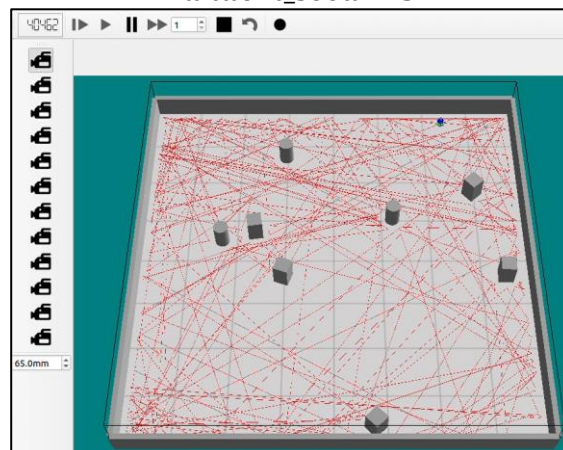
$$random\_seed = 1$$
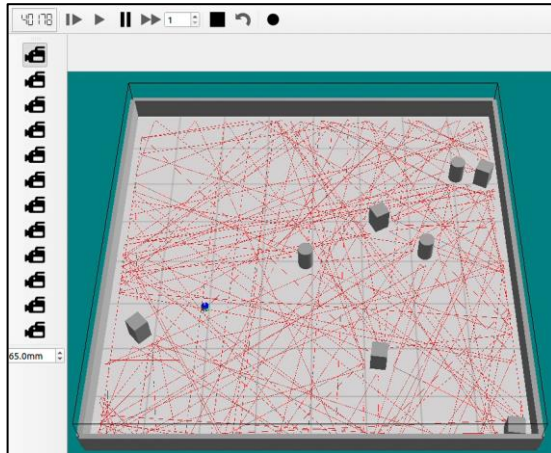
$$random\_seed = 2$$

$$random\_seed = 3$$

$$random\_seed = 4$$

$$random\_seed = 5$$

Important Note 2: We have tried different techniques such as trying to avoid an obstacle by steering instead of bump and change course, but the results were the Krembot spend a lot of time in the edges of the arena, or the Krembot didn't covered areas around obstacles, and even though we didn't achieve a significantly better times of coverage.